

Transactions *of* The Chartered Surveyors' Institution

SESSION 1936-1937.

AT THE ORDINARY GENERAL MEETING

*Held at the Chartered Surveyors' Institution, Monday,
1st March, 1937.*

Mr. J. M. THEOBALD (President) in the Chair.

NEW MEMBERS.

The following new members were received by the
PRESIDENT prior to the Meeting, and signed the Register:—

Fellow :

OSBORN, GEORGE WILLIAM.

Professional Associates :

BUXTON, SIMON FOWELL

CHITTY, ERNEST HEDLEY

CRICKMAY, JOHN RACKSTROW

GREENHILL, BRIAN JAMES

OXTOBY, ALLAN ALEXANDER

TURNER, ARTHUR HAROLD

TWYMAN, GEORGE

WRIGLEY, COLIN BRELSFORD

A DISCUSSION took place on Mr. CHRISTOPHER CHART'S
Paper entitled

THE PUBLIC HEALTH ACT, 1936.

Mr. E. J. SILCOCK (Vice-President), in proposing a vote of thanks to Mr. Chart for the paper, said there was no member of the Institution who was more fitted to undertake that task. Mr. Chart was chairman of a special Committee set up by the Institution to consider the draft Bill before it came before the Houses of Parliament to see whether there were any matters in the draft to which the Institution desired to direct the attention of the Minister of Health for his consideration before the final draft was presented to Parliament. In that capacity it had behoved Mr. Chart to consider very carefully the provisions of the Bill so that he could direct the discussions of the Committee along the lines which would be most fruitful; and in his paper the author had presented a most admirable review of the Act. As members would have noted by the way he introduced it, Mr. Chart was himself half a lawyer and had a thorough grasp of the surveyor's side of the Acts of Parliament dealing with public health. In particular he desired to thank Mr. Chart for the labour he had expended in preparing the Appendix, in which he had correlated the numbers of the sections of the new Act with those in the older Acts which it superseded. As one who had had to use those Acts of Parliament for a good many years, he was quite with Mr. Chart in saying that there were certain sections with which surveyors were quite familiar by their numbers, and therefore they would be very glad to have before them the corresponding numbers in the new Act.

The 1936 Act, as the author had said, did not deal with the whole of the ground covered by the Public Health Act, 1875, and there were two further Acts of Parliament looming in the future to cover the rest of it, and those other Acts would be as long as the one under discussion. The present Act would also require, undoubtedly, a great deal of study. There were a variety of topics which no doubt would be touched upon in the discussion, and in order that members might have the matter before them he did not propose to touch on many of them, but only to refer to one or two in particular.

There was the vexed question of the meaning of "sewer" and "drain," to which the author had referred in his opening remarks. That problem was now further complicated by the

introduction of the "private sewer," and members would have to consider very carefully the various sections of the Act which dealt with the three classes of sewers, the way in which they were to be adopted by the local authorities, and what powers those authorities had for recovering part of the expense of repairs from the owners of the property draining into the private sewers.

He noticed that it had now become compulsory for the authority to maintain a complete map of all the sewers in its district. As members knew, under the older Act that was a permissive duty, and it had been honoured in the breach rather than in the observance in a great many places. He often found, in going to towns to make inquiries about sewers, that the records were not as complete as they should be, and it would now behove all local authorities to bring up to date the records of their existing sewers and to prepare a complete plan so that they should be in a position to give information to people who inquired. There was one rather curious point about that provision, because apparently the map had to distinguish between sewers which were to be used solely for the sewage as compared with those which were to be used solely for surface water, but if a sewer was to be used for both purposes and was vested in the local authority before the Act came into operation, apparently it need not be shown upon the map. That was how he read the Act. He might be quite wrong; but it was rather difficult to understand why a sewer which was used for a dual purpose should not be equally recorded with one which was used for a single purpose.

Then there was the question of betterment in connection with the compensation for damage for laying sewers through private land. That was a subject which would have to come before members of the Institution, many of whom were concerned in preparing and dealing with claims for compensation, and one could only hope that it would not lead to the framing of extravagant claims for damage for fear that there should be a counterclaim for betterment. He thought that a sweet reasonableness must be exercised on both sides so as to avoid introducing extravagant claims either for damage or for betterment.

The provision that all by-laws should be reviewed from time to time was an admirable suggestion, and the Act provided that all existing by-laws would cease to operate on 31st July, 1939. That was, of course, a matter largely for the town clerk's department to see that they did not find themselves without any operative by-laws. Still, the surveyors to local authorities must be prepared with their new by-laws, and in that connection members should know that the Ministry of Health had prepared new model by-laws, the draft of which had been sent to the Insti-

tution for comment ; and Mr. Chart was again the chairman of the Committee specially appointed to consider that draft.

In conclusion Mr. Silcock referred to a possible anomaly in the interpretation clause which defined " coastal waters." He said that coastal waters, in Section 343, were defined as " waters within " a distance of three nautical miles from any point on the coast " measured from low-water mark or ordinary spring tides." For some reason or other there was no mention made as to the direction in which the three miles were to be measured, and presumably it was to be measured in a seaward direction, but the section did not say so. As it stood he suggested that the definition would equally include any waters on the landward side of low ebb mark within a distance of three miles.

Mr. T. PEIRSON FRANK, M.INST.C.E. (Chartered Surveyor) (Chief Engineer and County Surveyor, London County Council), in seconding the vote of thanks, said that those who were members of the Institution's special Committee dealing with the draft Bill as it then was—some twelve months ago—realised something of the work which Mr. Chart had then put in on behalf of the members of the Institution. Mr. Chart had added to that debt by the submission of the present paper, which certainly did what Mr. Chart had said he had set out to do. He had wanted to act as a finger-post to certain sections in the Act. That was probably the wisest thing Mr. Chart could have said about it, because such an Act as the 1936 Act was so large that it could not be compressed into a paper of ordinary length.

He desired to take the opportunity of thanking those whom Mr. Chart had met when he represented the Institution at the Ministry of Health—notably Mr. Maude—when certain amendments in the then draft Bill were effected. Mr. Silcock had mentioned that there were two other instalments of the Consolidating Act still to come, and he was sure members would share his hope that the number of sections in those two other portions might be reduced, and that the length of each section might also be reduced.

The 1936 Act, as was mentioned in the paper, came into operation on 1st October of the present year. Many members practised in the County of London. He did not know if he was supposed to speak at all from that area. Most of his work under Public Health came in the outer districts of London, where the London County Council were constructing some miles of new roadways and new sewers in different counties. Speaking for the County of London for the moment, there was an Act which had come into operation on 1st October, 1936, called the Public Health (London)

Act, 1936, and that Act had certain features which differed from the Act under discussion. The principal one was as regards the omission from the London Act of that new term to which the author had drawn particular attention, of a "private sewer." Combined drains under the general Act—*i.e.*, for the provinces—ceased to exist. They did not cease so far as London was concerned. Perhaps he ought to show members what the Local Government and Public Health Consolidation Committee thought about the state of affairs regarding the combined drain. Reading from the Second Interim Report of the Committee, page 27, that was the practice as it is to-day and as it would be until 1st October next, and this was the Committee's criticism after they had considered it very carefully: "More commonly, the practice of requiring an owner to execute an agreement making himself and his successors in title responsible for the maintenance of the pipes, notwithstanding that they technically form a sewer, has been adopted, though the effect of some of these agreements is not free from doubt."

The Committee said that those agreements which had been signed in many parts of the country were not free from doubt. Then at the bottom of page 28 and at the top of page 29, in rather telling language, the Committee continued: "Apart, however, from these considerations, we feel clear that tinkering with the language of Section 19 will provide no real solution of the problem, and that the time has arrived for abandoning the principle, which experience has shown to be unsound, that the responsibility for maintaining a particular pipe should depend solely on the question whether the pipe serves one or more than one building."

He need not trouble to read the end of the paragraph, but it would be seen that the Committee found that the condition of affairs was highly unsatisfactory (to put it quite mildly), and the local authorities had powers under the new Act in the provinces to make good at the owner's expense those combined drains which would become, after 1st October, public sewers. The author would correct him if he was wrong in this. That they remained as combined drains within the County of London was shown by the definition of a drain in the London Act, which included a drain for draining any group or block of houses by a combined operation. The definition did not say "drain"; it said "a combined operation under an Order of a borough council or their predecessors." Those orders, of course, would be issued by the metropolitan councils. The London County Council was the main drainage authority. The metropolitan borough councils submitted to the London County Council any schemes for new

sewers, and then they might make orders for combined drains within the County of London.

Coming to another section dealt with in the paper, where reference was made to the duty under Section 15 of the Act of 1875, where the author said that local authorities had thrown upon them the duty of providing sewers adequate for the drainage of their district, Mr. Chart mentioned that it was not incumbent upon them to provide such draining for the future development of their areas. Speaking at the moment to those members, of whom there were many, if not in that room, throughout the length and breadth of the country, who were engineers or surveyors, or assistants to engineers and surveyors of local authorities, he thought the best protection there was given under the Town Planning Acts, by which plans might be disapproved if there were not adequate facilities for drainage, amongst other provisions.

The author had raised a most important matter to everybody interested either from the local authority's standpoint or from the private estate development standpoint when he referred to the type of appeal which could be made. He had referred on page 211 of the Proceedings to the appeal to the Minister under Section 19 as to the reasonableness of the requirements. He wished to submit very strongly that that was a particularly good way of getting disputes settled. To his mind it saved time, it gave equity and it also saved cost, despite what might have been said to the deputation of the Council of the Institution which attended at the Ministry. He had attended on behalf of another council of engineers and surveyors, and asked that that method of settling disputes should be extended in some other cases. It would be noticed that the next words were that under the same section there was an appeal to a court of summary jurisdiction as to the amount of the repayment. He thought that the two might very well have been left to the Minister ; it would reduce the number of operations and save time again. Then in Section 37—it was not mentioned in the paper—the owner might choose either arbitration or to have his dispute settled by summary jurisdiction, and in the very next section he only had the option of an appeal in a court of summary jurisdiction. It seemed that those methods of settling disputes might be reduced to appeal to the Minister.

With regard to the duration of the Acts, he was in cordial sympathy with what the author had said in introducing the paper, that the time should, if possible, be limited before which any modifications would be approved. It might be a small matter, but actually there was the repeal of a certain portion of the 1936 Act now before the House in reference to Section 92 and also of part of Section 46, both of which the Factories Bill proposes to

repeal, because the Factories Bill, though not altering the law, groups under its own headings those particular matters which should be there rather than in the Act under discussion. It was not therefore actually a change.

In regard to the breaking up of streets, referred to in the latter part of the paper, at the Institution of Civil Engineers the previous week there had been a paper read dealing with the West Middlesex Main Drainage Scheme—a very large scheme—and there the author had mentioned that they had found it cheaper to tunnel in many parts of West Middlesex rather than have to face the inconvenience and expense attached to breaking in from the surface. Of course with most of the new main sewers in the County of London they were almost always tunnelled because they were laid at considerable depths.

Members would agree that Mr. Chart had thoroughly earned the vote of thanks. In the latter part of his paper he said that the Council of the Institution were able to make representations to a similar effect in the proper quarter before the Public Health Bill was introduced. Those representations had been made by Mr. Chart on behalf of the Institution. There was a reference in the last paragraph to somebody “doing his bit.” Members would concur that Mr. Chart had, in his previous work and in the submission of the paper, “done his bit” for those who were members of the Institution.

LORD ADDINGTON said it was a great privilege and pleasure to him, having been chairman on the Committee which drafted the 1936 Bill, to be allowed to listen to and take part in the discussion. He was now well on the way in drafting the second Bill, and he could certainly assure members that it would not have as many clauses as the Act under review. How many clauses there would be, or how many Bills there would be, was still quite uncertain; but what the Committee had tried to do was to consolidate a lot of Acts which were numerous, and which were open to very grave doubts in interpretation. One could not read Mr. Chart's paper without being struck with the confusion of the law as it stood with regard to the important matter of drains and sewers; so that it was the first object of the Committee, in drafting a Bill, to make the law as clear and as intelligible as possible to those who were concerned with it, both as administrators and as developers. The Committee had also tried again to bring the practices of public health and sanitation into line with modern practice and with the latest developments that were often to be found in the private Acts, and to see that the councils who wanted the advantages of the powers of the

latest Acts should not have to incur the great expenses of going to Parliament for a Bill of their own, but should be able to take advantage of the clauses in the 1936 Public Health Act. Again, he thought the Committee had tried as fairly as possible to hold a balance between the local authorities who were always wanting more powers to make more requirements, and the developer who was developing the country, to whom the Committee did not want to add more than it needed to the expense of development. One of the points in which that was shown was the question of appeals. Speaking rather from memory, what the Committee had tried to do was to keep the technical matters as an appeal to the Minister, and then give the public what the public always preferred, namely, an appeal to a court wherever there was a question which the court could determine as to reasonable requirements. He hoped that in that respect the Committee had made it a good deal easier for the developer and for the councils in being able to go to the court, and not having to do work and afterwards see whether it was legal or whether it was not.

The author, on the whole, had been very kind to the Committee and to the Bill. He had said that the Committee had made the law very much easier, and that the Bill was a good Bill. He was sure that he, himself, and his Committee, would be very glad to do anything to improve the public health law of England, and to make easier the task of members of the Institution.

Mr. HERBERT WILLIAMS, M.P. (Visitor), said he was not one of those who served on the Committee which drafted the Bill, and so could not claim to be either a parent or a grandparent of the Act. He was, however, more or less a godparent, because he had been one of the House of Commons representatives on the Joint Select Committee of which Lord Addington was, perhaps, the leading member, when it had the task of expressing its comments on the work of Lord Addington's Committee. That task had been a relatively easy though not a light one, and the Joint Select Committee had had the assistance of some very able witnesses representing every point of view, so that he imagined that the Act as it stood was about as good as it could be made for the time being, always bearing in mind that one could not get perfection, for a variety of reasons—nobody knew everything, and there were legitimate conflicts of interest which made it very difficult to achieve perfection.

Until he had come to that meeting he had not had the slightest idea of the extent to which the minds of members of the Institu-

tion were dominated by drains and sewers. That was a rather dreadful thought. All he knew about them was that he had once helped to construct a very big one, about which Mr. Peirson Frank knew most, from Battersea to Deptford. It was so big a one that he believed he was the first person ever to put electric locomotives in a sewer, not for the purpose of carrying sewage, but for the purpose of carrying to the shafts material that was being extracted by the miners. He thought it had startled a good many people to think that there was a little tram running in a sewer. He had had an affectionate regard for sewers ever since, but they were much more complicated the smaller they got. There were not many legal problems over the big ones, except that if one tunnelled one had to photograph every building for about three miles each side before starting operation, otherwise all the inhabitants protested that every crack was due to the tunnelling.

The amazing thing about the Public Health Act was, in one sense, how little the general public realised its importance. He had often said, when making a controversial speech, that the Public Health Act, 1875, was the most important Act passed for a hundred years. He remembered reading a biography of Benjamin Disraeli by another statesman not of the same political persuasion, in which that Act was not alluded to. That had struck him as amazing, and showing a false outlook on what it really meant to the people, because that Act dealt with a matter of fundamental importance to every man, woman and child in the land. He thought that the Public Health Act ought to be amended regularly about every ten years in order that the general law might be brought into accord with the law which had been tried out experimentally and proved successful in the localities. On the other hand, he agreed that the localities ought not to experiment just after a new Act had been passed. It was better to find out how the new Act was working before any municipality, in promoting a private Bill, sought any substantial amendment. On the other hand, if a municipality had entirely new ideas, something right outside the scope of the Act as it stood, and provided their ideas were found on examination to be good ones, then it was a good thing for the law gradually to be built up in that way. A good many of the bright ideas they had, he personally thought, were not too bright, and that was why he took care to try and see that they did not pass ; but that was another matter.

Another important point, not only on amendment but on consolidation, which affected members of the Institution and also the great mass of town clerks and surveyors in public employ, was that they did not always remember what the law was. The tragic thing was that municipal administrators would not use the powers

which Parliament had given them. Time and again Bills were brought into Parliament, sometimes promoted by private Members who were introducing a general Bill, sometimes promoted by municipalities asking Parliament for powers which they had possessed for years and had not taken the trouble to put into operation. In the present Session there were about twenty Bills promoted by municipal authorities, in each of which there was a clause seeking the power to put railings along the pavement to prevent the people from dashing into the moving traffic, and he thought he was right in saying that that power was contained in an Act passed several years ago, and there was no reason why municipal authorities should not protect life in that way without asking for a new Bill.

The part of the new Public Health Act which he liked best was Section 91 and its family—the Nuisances section. He had no malicious intent in saying that, but under the Nuisances section it was possible, perhaps, to do more to safeguard the health of the community than under any other general section, and he was quite satisfied that under the Nuisances section he could do nearly all that was necessary. What amazed him was the timidity of councils in using their powers. There had been imposed by Section 91 on every municipality the duty to cause their district to be inspected from time to time. He thought that that gave them a right of entry into all premises for the purpose of seeing that those premises were not in such a state as to be prejudicial to health or a nuisance. He took these latter words from Section 92, and he hoped that the law had now been clarified, and particularly as to definitions in the latter clause, especially the definition of “workplace,” which happened to be a matter in which he had taken a great deal of interest on several occasions in opposing unnecessary Bills in Parliament. The definitions were now so clear, he thought, that no municipal administrator had the slightest excuse for failing to enforce properly the very necessary provisions which had been the law of the land in fact from 1875, and in his judgment had not been enforced with the vigour with which they should have been enforced.

He was very grateful to Mr. Chart, with whom he had connections elsewhere, for the time and trouble he had given in preparing his paper. He had attempted almost the impossible, because quite clearly an Act of Parliament on which later there would be books of many volumes could only be touched on in a paper of that size. The value of Mr. Chart's paper was that he had impressed upon every member of the Institution that the Act had been passed; he had laid his finger on important parts of the Act, and had stimulated discussions which began only that

evening. He was certain that discussion would continue throughout the land, in offices, in journals and elsewhere, and he hoped that, as the result of the paper, the Act of Parliament, when it came into operation in October next, would prove of real value and a real safeguard to the people of this country.

Mr. E. J. MAUDE, C.B. (Deputy Secretary, Ministry of Health), said he wished to join in the thanks which had been accorded to the reader of the paper, and in particular to express his admiration of the amazing accuracy with which he had done a most difficult thing—to summarise, in a comparatively short space, a very long and complicated Act of Parliament. He had read the paper through carefully himself and had asked an expert in the Ministry of Health to do the same, and they had concurred in finding only two passages in which there might be any room for misconception. The first was an unimportant matter: Mr. Chart referred to the fact that the Departmental Committee, in dealing with water in Part IV. of the Act, had adopted a clause enabling local authority water undertakers to make an extra charge for more than one water-closet or bath. It would be found that that was so. Mr. Chart had pointed out why that provision was rather absurd; he would not give the reason because it would be found in the paper. The reason for its insertion was that the Committee felt themselves bound by a long series of local Acts. When the matter reached the Ministry, the Institution, amongst other bodies, pointed out that that was a rather absurd provision. The author had suggested that the reference to the second water-closet but not the reference to the second bath had been struck out. In fact what had been done was to provide in Section 126 of the Act, as he thought was reasonable, that an extra charge might be made, not for a second or third or fourth bath, but for a bath of extra large dimensions. That was a matter of common-sense.

There was one other point on which the paper was possibly open to misconception. The author had pointed out that a later section of the Act provided that if land was taken compulsorily for the purpose of laying sewers or water mains, and the price was the subject of arbitration, the arbitrator must take account of betterment, and had added that a Select Committee had considered that subject in connection with a clause generally known as the Romford Clause, and had recommended against a clause setting off betterment against compensation. The paper made it clear that the Committee had reported after the Bill was framed, so that the framers of the Bill could not, in any event, be accused of disregarding the recommendation of the Committee. In point of fact, however, what the Committee had before them were local

Act clauses in which not only was the owner liable to have betterment set off against compensation, but subsequently, when the sewer was made, he was liable to be charged as a frontager. That was what the Committee objected to.

Those were only two specks in the sun. As regarded the rest of the paper, he thought that it was extraordinarily accurate, and where Mr. Chart expressed opinions he respectfully agreed with them. Mr. Chart pointed out quite rightly that the most important change in the law in Part II. was the system of adopting sewers, that that was experimental, and that to judge of its merits one would have to await actual cases arising and actual decisions of the Courts. He felt, for himself, that the law would perhaps not be quite as simple as it sounded on paper. What it did was substantially to maintain the *status quo* in regard to old drains. Mr. Silcock had mentioned a point about maps of sewers. There was a provision in the Public Health Act, 1875, which enabled an urban authority to make a map of its sewers. A later provision in an Act of the 'eighties dealing with the support of sewers required a local authority to make a map of their sewers. That provision was part of the general law, but it had usually been treated as only applying to mining districts, and elsewhere was practically a dead letter. The present Act required every local authority to make a map of its sewers, subject to the exception, upon which Mr. Silcock had commented, that the obligation was only to apply to existing sewers if they were reserved for foul water only or for surface water only. Mr. Silcock had remarked that that seemed anomalous, and at first sight it did. The reason for the provision was that if one took an old town like Leeds or Sheffield it would be very expensive to trace the course of every existing sewer, because sewers were not necessarily built, or indeed generally built, by the local authority at all. On the other hand, if a council had adopted a system of separate surface-water and foul-water sewers, it could be assumed that those sewers had been built either by the local authority or, at any rate, under their direction, and would already be known to them. The Committee had therefore made that distinction, which Parliament had subsequently adopted, and they were careful to provide in an earlier section of the Act that the old obligation of an owner not to build over a sewer was only to apply in the future to sewers which were marked on the map. That seemed reasonable from the owner's point of view.

Lord Addington had dealt with Mr. Frank's point on appeals. He thought that that subject, which was a large one, required a separate paper.

He agreed with Mr. Herbert Williams that one advantage of

the type of legislation under discussion was that the people administering it would have no excuse for not getting to know the law. He had not in his head the figures showing how many sections of how many different Acts the 1936 Act replaced, but he could give figures for the two Acts—the Local Government Act, 1933, and the Public Health Act, 1936, taken together. The two Acts, which consisted of 650-odd sections, replaced 1,500 sections, and made it possible to repeal either wholly or partially 260 Acts.

The MAYOR OF MITCHAM (Alderman J. P. TURNER, J.P.) said he regarded it as a great honour to be invited to the meeting, and how pleased he was at being present, all the more so as Mr. Chart belonged to Mitcham. At Mitcham they were very proud of the Chart family, which was bound up with the whole of the borough, Mr. Chart's brother being town clerk and his father a former mayor.

Mr. WILLIAM THORPE (Chartered Surveyor) said that he was interested in the author's reference to the making up of streets under the Public Health Act, 1875, where it was mentioned that the council could not include establishment charges. He had come across councils who, when making up roads under Section 150, included a percentage for establishment charges. When developing estates at the present time it was the practice of owners to make up the streets in accordance with the council's requirements and ask for them to be taken over as public highways. The reasons for the developers taking that course were that there was a delay in getting the roads made up by the councils, and also, having clean roads instead of quagmires, helped in the sale of the houses. When councils took over roads which had been made up by the developers they insisted upon a percentage of the total cost being paid to them for supervision. He said that it seemed unfair that the councils should make that charge, as they did not do so when making up the roads themselves. When the Act comes into force in October charges could be enforced, but he could not see why they should have been charged in the past. He had advised clients to pay the charge and get the roads taken over and so avoid delays. He would like to have Mr. Chart's observations on the point if he had had experience in the matter. He agreed that the council's surveying staff had to superintend the making up of roads, but that had to be done in any case when the council made them up themselves. He had an instance at the present time where a street had been left in a very bad state for twelve months. The owners had been asked to make up the road under the Public

Health Act, but owing to the number of different owners that was not possible, and it was left to the council to carry out the work.

Mr. THOMAS BRENT (Fellow) said his own practice brought him into very infrequent and slight touch with matters of the Public Health Act, but he gladly tendered his small meed of thanks to his old friend Christopher Chart for his excellent paper.

For many years he had been associated with Mr. Chart as an active member of the County Branch, to which they both belonged, and it was a matter of the greatest marvel to him to see the amount of time and effort that Mr. Chart was able to put in both on behalf of the Institution and on behalf of the County Branch.

It was evident that he was not the only one who had turned with great interest, on receipt of the paper, to the old question of drain and sewer, but he was rather disappointed to read in the paper that apparently they were still to have the same vexed question with them. It might be somewhat palliated by the new legislation, and he hoped from some of the remarks in the paper and in the discussion that the position in future would be somewhat clarified.

An important point in the concluding part of the paper was with reference to the question of the term "owner" and the liability of an agent being limited to the amount of estate funds which that agent had in his hands. It had always seemed to him most inequitable in principle that an agent should be liable for more than that, and it was very gratifying to know that, in the 1936 Act at any rate, that had been set right.

The last words of the paper had struck him most forcibly as to the objects of the Institution. One of the previous speakers had said that Mr. Chart had well and gallantly "done his bit" in producing the paper for the assistance of his fellow-practitioners, and he wished warmly to support that sentiment.

Mr. C. SIMPSON (Professional Associate), in thanking the author for his paper, assured him that it had been read with great interest in the provinces as well as in London. He had discussed it with several old members, who had one and all expressed their thanks to Mr. Chart in various ways for the way he had elucidated so difficult a problem.

He desired to ask one question. The author stated that in Section 25 no building might be erected over sewers shown on the map without consent. Many members knew that the worst drains were the old drains, and apparently houses could be built, as far as the 1936 Act was concerned at any rate, over those old

drains without any power to prohibit them. Also, in the new schemes that were being put before councils and before the Ministry every day, combined drains were, in the majority of cases, used. Was it to be assumed that, so far as the 1936 Act was concerned, there were no powers which prohibited people from building over those sewers or combined drains where they were laid at the present time in fields, which later on might be developed as building estates?

The vote of thanks was carried with acclamation.

Mr. CHRISTOPHER CHART, in reply, thanked Mr. Silcock and Mr. Peirson Frank for the kind words they had used in proposing the vote of thanks. He would follow the usual custom of making any comments on the discussion and answering questions in the *Journal*. He much appreciated the extraordinary kindness of everyone who had spoken, and if his efforts had been of any service to the members he would feel amply rewarded.

The following written reply has been received from Mr. CHRISTOPHER CHART:—

I am more gratified than I can express at the kindly reception given to my paper; very few questions have been asked, and most of them were replied to by previous speakers, but there are two which demand my replies.

Mr. Simpson asks if there are no powers in the 1936 Act to prohibit people building over old sewers or combined drains laid through fields which may later on be developed as building estates, and points out that the worst drains are old drains. I believe that the answer to this question can be found in the paper (page 218), but to put it more clearly, the existing prohibition against unauthorised buildings over sewers is found in the 1875 Act, Section 26 (1), which is repealed by the 1936 Act, Section 346 and 3rd Schedule, in lieu of which we shall have Section 25 of the 1936 Act, which prohibits unauthorised building over any sewer or drain shown on the map of public sewers, which it is the duty of the local authority to keep in compliance with Section 32.

Mr. Thorpe asks a question relative to a practice which he says obtains with some local authorities of demanding establishment charges when a developer proposes to make up a street with a view to its adoption as a highway repairable by the

inhabitants at large, and those authorities have not adopted the Private Streets Works Act, 1892. As I point out in the paper (page 204), the 1936 Act does not deal with streets, so that the question only arises with regard to the general provisions of Section 292 as to establishment charges. I entirely agree with Mr. Thorpe that there is no statutory authority for imposing establishment charges under these circumstances, but I dissent from his view that such action is "more or less holding a pistol "to the developer's head"; it is true that there is no such provision in the 1875 Act, but in 1892 Parliament thought fit to give such powers to local authorities in the Private Streets Works Act, and, as a matter of equity, I fail to see why the matter of establishment charges should depend upon the accident of whether or not the authority have adopted the 1892 Act. The Departmental Committee in their "Notes on Clauses," point out that the powers contained in Section 9 (2) of the Act of 1892 have also been conferred on local authorities in local Acts, and they recommend that it shall now become part of the general law.

I would especially thank Mr. Maude for his kindly criticism, I am sure that no one is more competent to express such views than he; I need hardly say that I appreciate and concur in his remarks in clearing up the only two matters in which he feels there might be room for misconception.

I am glad to find my friend Mr. Herbert Williams, M.P., in agreement with some remarks which I made in introducing the paper for discussion. I commented on a report made to our Council that a Bill had been presented in the present Session for a local amendment of Section 28; Mr. Peirson Frank referred to a similar proposal as regards Section 92. Mr. Herbert Williams agrees that local authorities ought not to experiment just after a new Act has been passed, but to find out how it is working before seeking any substantial amendment. I venture once more to suggest that Parliament should definitely fix a "close season" during which fledgling Acts of Parliament should not be subject to local amendments.

Once more I thank the proposer and seconder of the vote of thanks and all those who contributed to the discussion.

PAPER No. 576.

VALUATION OF LIFE INTERESTS IN REAL PROPERTY AND REVERSIONS.

By F. L. Collins

(Fellow of the Institute of Actuaries).

*Paper to be read at the Ordinary General Meeting of the
Chartered Surveyors' Institution on Monday, 5th
April, 1937.*

INTRODUCTION.

The date for this paper revives a recollection of the days when on leaving Oundle I was with a land agent and valuer at Bury St. Edmunds, where I had an early though rather brief experience of the duties of your profession ; for I remember that in Suffolk the dates for the half-yearly payment of rent were the 5th April and 11th October, the latter being the usual date for valuing the effects upon the farms changing hands. When given the opportunity of addressing your Institution, by invitation on behalf of the Institute of Actuaries, therefore there was no reluctance on my part. It is right to add that my remarks are entirely my own, and neither body is in any way responsible for their accuracy or completeness.

MORTALITY TABLES.

Actuaries are concerned with construction of Mortality Tables. The object is to ascertain the rates of mortality

prevailing among various sections of the community from statistics in order that forecasts may be made for the future. It is essential for this purpose that the data should be large enough and modern enough and should relate to the type of life with which the problems of the future will be concerned.

The theory of probabilities upon which the science depends consists in the comparison of the number of times a given event does happen out of the number of times that it can happen. For example, if a coin be tossed a sufficient number of times, the heads and tails ought to turn up with equal frequency. The number of times would have to be infinite to produce the true result, viz., half, as the probability of either heads or tails turning up at a trial. For practical reasons the number of trials has to be limited to the extent of the available data, and consequently the rates of mortality derived from observations will never be exactly correct except by accident. Therefore two processes are involved in a mortality investigation. First, the number exposed to risk is determined age by age, and secondly, the proportions of lives who die at particular ages are subjected to a process known as graduation. If successful, the resulting proportions at each age will then represent the true rate of mortality at that age. When the true rates of mortality are applied to the number known as the radix at birth, which is usually a round figure (say) 10,000 or 100,000, it is a mere matter of arithmetic to deduce the number dying in the first year of age. Those who survive to age 1, represented by the 10,000 or the 100,000, as the case may be, less the first year's deaths, are treated in the same way by the rate of mortality at age 1 to determine the deaths at age 1, and hence the survivors at age 2 and so on to the end of the table at the limiting age of over 100. If the radix of 100,000 were regarded as that number of babies at birth and the rates of mortality did not alter for 102 years, the life table could be constructed simply by counting the number of

survivors year by year on the anniversaries. Farr, who prepared the well-known English No. 3 Life Tables, defined them as "the march of a generation through time." Of course to attempt to treat 100,000 babies in this way would be like the sailor who heard that parrots lived for 100 years and bought one to see. Indeed the constant changes in the rates of mortality which happen in so long a period would mean that the table was obsolete long before it could be completed.

The main object being to produce records of the past which can be used as a precedent for the future, it is clear that the more up to date the table the more reliable it will be. As will be shown presently, the great general improvement in longevity which has occurred since the passing the Public Health Acts leads to the hope that the rates of mortality will continue to decrease at all except the advanced ages. This fundamental idea has been adopted by the Government in the most recent experience, and also by the Institute and Faculty of Actuaries as regards annuitants. The period 1900-20 was in each case split into three sections. The later the section in point of time, the lower was the rate of mortality. Those in the last were reduced in the same ratio for a further five years, so that the published results in each case represented the mortality of 1925. In a further investigation by the Institute of Actuaries it was found that the 1925 results were identical with the forecast. My reason for stressing this aspect is to emphasise the fact that the Northampton and Carlisle Tables are obsolete.

History of Existing Tables.

The motto thus being "*Respice, aspice, prospice*," the past history of mortality tables is interesting. In the days of ancient Rome a table of present values, according to age, was used for fixing the number of years' purchase of life leaseholds in connection with the laws of inheritance.

known as "Ulpian's Table," but the basis is unknown. The first actuary was De Wit, the Grand Pensionary of Holland, who in the 17th century prepared life annuity tables in which the interest element was correctly used for the first time. These annuity rates were to be used for financing the war against England in place of the then method of granting 12 per cent. to all comers for life without restrictions as to age or sex. Whether De Wit became unpopular as a result is not known, but he died on the scaffold.

Meantime you may remember the Dutch under Van Tromp succeeded in coming up the Thames. This method of war borrowing was imported to England in the reign of William III., whose soubriquet "Dutch Billy" suggests that he may have been the means. The Tontines which were established under his auspices did not involve any mortality loss. There were a certain number of subscribers (including a certain proportion of Government nominees) who divided the income. As time went on the number of survivors grew gradually less, and their proportionate share in the income correspondingly greater until the last survivor enjoyed a brief spell of glorious existence with the whole income, and the whole thing came to an end. Naturally only the healthiest indulged in this pastime, and as the results were recorded with care, the rates of mortality were afterwards adopted by Finlaison, the Actuary of the National Debt Office, as a basis for the Government annuities which are still being granted by the Commissioners as a means of redeeming the National Debt—not on the same terms, of course. In the latter part of the 18th century a number of wildcat schemes were promoted by ingenious and dishonest persons. They offered widows' annuities on attractive terms in consideration of a lump sum down. When the inevitable insolvency occurred it usually transpired that the promoters had disappeared.

Dr. Price, who was a great financial expert at the time and whose name will ever be associated with the

“ Old Equitable ”—(his full-length portrait by Gainsborough hangs in the Board Room to-day)—published a series of editions of a work *Observations on Reversionary Payments*. He was public-spirited enough to want to show up these nefarious schemes by proving that the benefits could never be provided at the prices charged. When it became necessary to find data he was faced with the difficulty already mentioned, that only by combining the number living with the number dying at each age or group of ages can rates of mortality be determined properly. Nevertheless, in an ideal community free from emigration and immigration recruited annually by a constant number of births, the deaths alone would represent the numbers at each age in the life table. Even at the time of the Great Plague of London bills of mortality were recorded, and in Northampton (with which Dr. Price no doubt had some personal connection) he obtained them for the parish of All Saints. These deaths formed the basis of the table on page 252, which has been extracted from *Baily on Annuities* (published in 1864) on page 290, to which I have added the expectation of life on page 292.

A curious feature of the foregoing table will be at once noticed. The deaths over a series of ages are uniform. De Moivre's hypothesis, which consisted in the theory that the number living decreased in arithmetical progression, was responsible for this. De Moivre was a very distinguished mathematician who escaped to England after the revocation of the Edict of Nantes. He found that the rates of mortality by certain tables were in harmony with the number of deaths at each age being uniform, so that as the number living decreased the rate of mortality increased in inverse proportion. Hence it is not unlikely that Dr. Price adjusted the data to accord with the theory. Apart from this, Northampton was not a place which fitted the ideal conditions. Owing to the boot trade there was a large influx of population from the country at the working ages, and the deaths were too numerous owing to the cumulative effect of summing from the bottom upwards. This exag-

NORTHAMPTON TABLE OF MORTALITY.

Age.	Living.	Deaths.	Expecta- tion of Life.	Age.	Living.	Deaths.	Expecta- tion of Life.
0	11650	3000	25.18	48	3014	78	19.00
1	8650	1367	32.74	49	2936	79	18.49
2	7283	502	37.79	50	2857	81	17.99
3	6781	335	39.55	51	2776	82	17.50
4	6446	197	40.58	52	2694	82	17.02
5	6249	184	40.84	53	2612	82	16.54
6	6065	140	41.07	54	2530	82	16.06
7	5925	110	41.03	55	2448	82	15.58
8	5815	80	40.79	56	2366	82	15.10
9	5735	60	40.36	57	2284	82	14.63
10	5675	52	39.78	58	2202	82	14.15
11	5623	50	39.14	59	2120	82	13.68
12	5573	50	38.49	60	2038	82	13.21
13	5523	50	37.83	61	1956	82	12.75
14	5473	50	37.17	62	1874	81	12.28
15	5423	50	36.51	63	1793	81	11.81
16	5373	53	35.85	64	1712	80	11.35
17	5320	58	35.20	65	1632	80	10.88
18	5262	63	34.58	66	1552	80	10.42
19	5199	67	33.99	67	1472	80	9.96
20	5132	72	33.45	68	1392	80	9.50
21	5060	75	32.90	69	1312	80	9.05
22	4985	75	32.30	70	1232	80	8.60
23	4910	75	31.88	71	1152	80	8.17
24	4835	75	31.36	72	1072	80	7.74
25	4760	75	30.85	73	992	80	7.33
26	4685	75	30.33	74	912	80	6.92
27	4610	75	29.82	75	832	80	6.54
28	4535	75	29.30	76	752	77	6.18
29	4460	75	28.79	77	675	73	5.83
30	4385	75	28.27	78	602	68	5.48
31	4310	75	27.76	79	534	65	5.11
32	4235	75	27.24	80	469	63	4.75
33	4160	75	26.72	81	406	60	4.41
34	4085	75	26.20	82	346	57	4.09
35	4010	75	25.68	83	289	55	3.80
36	3935	75	25.16	84	234	48	3.58
37	3860	75	24.64	85	186	41	3.37
38	3785	75	24.12	86	145	34	3.19
39	3710	75	23.60	87	111	28	3.01
40	3635	76	23.08	88	83	21	2.86
41	3559	77	22.56	89	62	16	2.66
42	3482	78	22.04	90	46	12	2.41
43	3404	78	21.54	91	34	10	2.09
44	3326	78	21.03	92	24	8	1.75
45	3248	78	20.52	93	16	7	1.37
46	3170	78	20.02	94	9	5	1.05
47	3092	78	19.51	95	4	3	.75
				96	1	1	.50

gerated the mortality, but tables being scarce, Dr. Price used the tables for the premium rates. In course of time large surpluses arose. The success of the office and the big bonuses, which have been a feature of the "Old Equitable," were the origin of the bonus system so familiar in life assurance to-day. Illogically, the profits derived in the business of life assurance led to the Northampton Table being used for annuity business, which is, of course, the exact opposite, by the Government. The life offices found it impossible to compete with the high rates offered. At that time nominees could be selected and a good investment secured by choosing the right type. Partly no doubt at the instance of the Government Actuary, Mr. Finlaison, the Actuaries' Club, which then safeguarded the interests of the profession, pointed out to the Treasury that the terms involved heavy loss to the country. As their protests were repeatedly ignored, they finally bought annuities from the Government for their own offices, and derived both fun and profit. In the end the Government adopted Mr. Finlaison's Tables, which were based on the experience of the Irish Tontines already described. Before leaving the Northampton for the Carlisle Table it will be convenient to dispose of what is really a matter of interest to your profession.

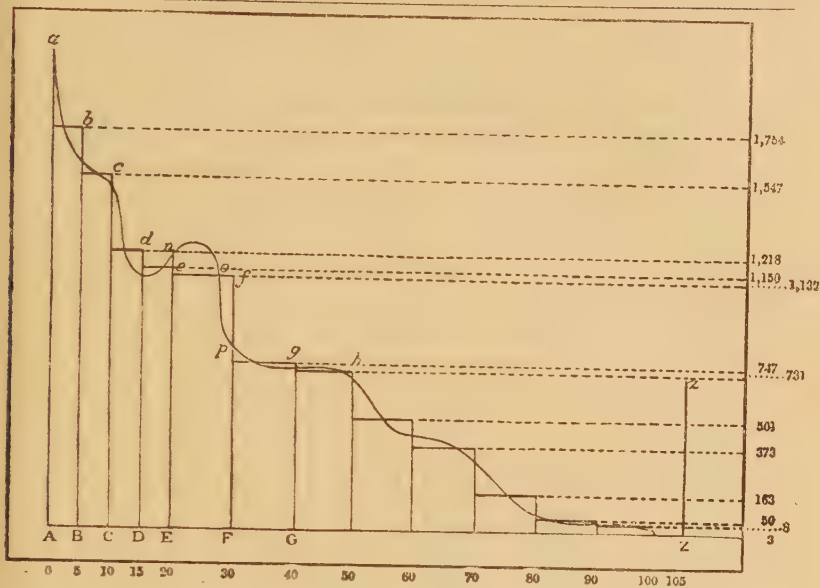
Expectation of Life.

The late Mr. H. W. Manly, who was the Actuary of the "Old Equitable," when delivering his presidential address to the Institute of Actuaries in November, 1899, said: "Many of our expressions are quite misleading, and although we know what they mean, the public attach quite different meanings to them," and instanced the "expectation of life." If you will refer to the table you will be able to see just what it really means. Sum the number living from the bottom up to age 81, for example. The total is 1,996, and it represents the total number of complete years which the 469 persons living at age 80 will, *on the average*, enjoy. Divide 1,996 by 469, and the result

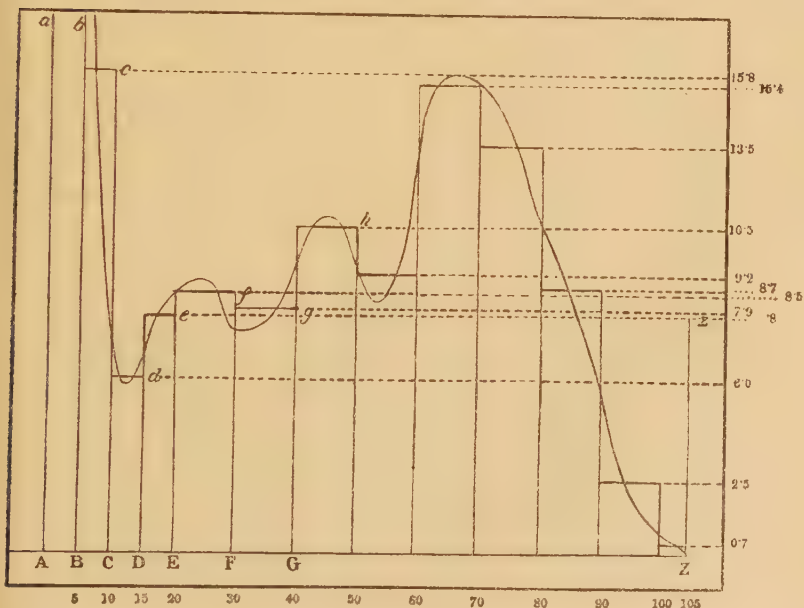
is the average number of years per person, viz., 4·25, which is known as the "*curtate*" expectation of life, because only integral years are counted. But actually people do not die on their birthday, but on any date in the year and any fractional age at which it pleases the Almighty to call them. There is an adjustment of half a year to be added to the 4·25, therefore, which raises it to 4·75, as shown in the table, which is the *complete* expectation of life.

Carlisle Table.

The old masters regarded the law of mortality as immutably fixed like the laws of the universe, and though, needless to remark, it was never discovered, just as the philosopher's stone for transmuting metals into gold was the means of producing modern chemistry, so their researches led to valuable knowledge. The abridged Bills of Mortality of Carlisle for the nine years 1779-87 by Dr. Heysham fell into the hands of Mr. Joshua Milne ; and they fell upon fruitful soil. That was not all, for the populations of the parishes of St. Mary and St. Cuthbert in January, 1780, and December, 1787, in groups of ages were also tabulated. Thus for the first time the two essential elements of population and deaths were available, and, with a trifling overlap, they were centrally situated at an identical point of time. Mr. George King, in a classic paper printed in Vol. XXII. of the "Journal of the Institute of Actuaries," gave a vivid description of the process of graduation by Mr. Joshua Milne. It is from that paper that the following diagrams are extracted. They were drawn to such an enormous scale by Milne that the whole of the floor at one of the rooms in Threadneedle Street, occupied by the Sun Life Office, of which he was actuary, was covered. The rectangles represent the groups of population and deaths between the respective ages on the base line. Milne's object was to draw a curve through



CARLISLE POPULATION CURVE.



CARLISLE DEATH CURVE.

the tops of these rectangles in such a way as to maintain the same area and distribute the numbers in a smooth progression. By reading off the ordinates at each age, he was able to divide the number of deaths by the population at every age from birth. From such humble beginnings sprang a table which has become famous for the number of valuable monetary tables involving as many as three lives which were afterwards published. One still in use is before me now by David Jones, actuary to the Universal Office "under the superintendence of the Society for the diffusion of useful knowledge" in 1843. Useful indeed it was, for it had about a quarter of a century's use for life office valuations, and even when my first introduction to a life office took place in 1895 the premium rates for "with-profit policies" were Carlisle 3 per cent., loaded 25 per cent. Where with-profit policies are concerned, it is of course the method of distribution of bonus that has to be considered as well as the mortality, but it means that by what may be termed a happy accident Milne did find a mortality basis which fitted the early Victorian era.

English Life Tables.

Since the census of 1841, which Farr took as the basis of the first officially published English Life Tables, it has been the custom to review the mortality experience of the country after each successive census. The last of the Registrar-General's Decennial Supplements, issued in 1936 at 3s. net by H.M. Stationery Office, contains the last of the series of Life Tables based on the 1931 census and the deaths of the adjacent three years 1930-32. For a long time it was the practice to take the deaths recorded in the intervening years between two successive censuses. In 1911 Mr. George King adopted the plan now used, on the ground that it gave a closer approach to contemporaneous mortality. The late Sir Alfred Watson, the Government Actuary, whose report forms part of the above Decennial Supplement, followed the same lines in 1921 and 1931, and it is likely that the idea has come to stay. It is necessary to bear this in mind

when considering the following table which has been extracted from the current "Whitaker's Almanac," page 1029, which illustrates the continuous improvement which has taken place in the last few censuses especially. In the table are shown the expectations of life at various epochs, and I shall perhaps shock you when I say that an actuary does not employ the expectation of life for any purpose, other than this, but more of that anon.

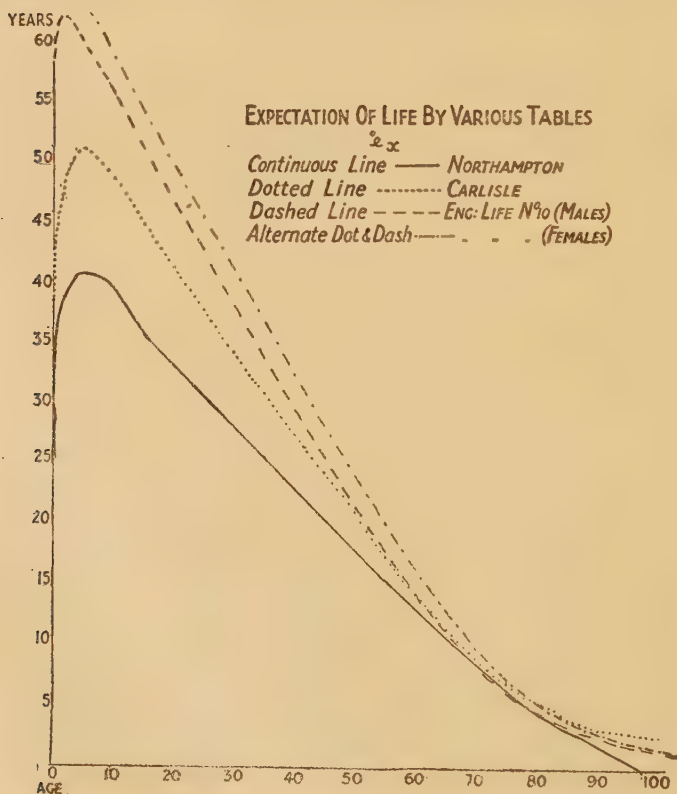
EXPECTATION OF LIFE IN ENGLAND AND WALES, CENSUS BY CENSUS.
Males.

Age.	1881.	1891.	1901.	1911.	1921.	1931.	Excess of 1931 over 1881 (fifty years).
							Years.
0	43·4	43·2	45·9	51·6	55·5	58·7	15·3
5	52·0	51·8	54·1	57·2	58·8	60·1	8·1
10	48·6	48·1	50·1	53·1	54·7	55·8	7·2
15	44·4	43·7	45·7	48·6	50·2	51·2	6·8
20	40·3	39·5	41·5	44·2	45·8	46·8	6·5
25	36·5	35·6	37·4	40·0	41·6	42·6	6·1
35	29·1	28·0	29·5	31·7	33·3	33·9	4·8
45	22·4	21·1	22·3	23·9	25·3	25·5	3·1
55	16·0	15·0	15·9	16·9	17·8	17·9	1·9
65	10·5	9·7	10·4	11·0	11·4	11·3	0·8
75	6·1	5·7	6·1	6·4	6·6	6·4	0·3
85	3·3	3·1	3·4	3·6	3·7	3·5	0·2

Females.

Age.	1881.	1891.	1901.	1911.	1921.	1931.	Excess of 1931 over 1881 (fifty years).
							Years.
0	46·6	46·7	49·8	55·4	59·5	62·9	16·3
5	54·0	54·1	56·7	59·9	61·7	63·2	9·2
10	50·6	50·4	52·9	55·9	57·5	58·9	8·3
15	46·4	46·0	48·5	51·4	53·1	54·3	7·9
20	42·4	41·9	44·3	47·1	48·7	49·9	7·5
25	38·6	37·9	40·1	42·8	44·5	45·6	7·0
35	31·4	30·3	32·0	34·4	36·1	36·9	5·5
45	24·4	23·2	24·5	26·3	27·8	28·3	3·9
55	17·5	16·3	17·5	18·9	19·9	20·2	2·7
65	11·5	10·6	11·4	12·4	12·9	13·1	1·6
75	6·7	6·2	6·8	7·3	7·5	7·5	0·8
85	3·6	3·4	3·7	4·1	4·1	4·0	0·4

Except at the very advanced ages where mis-statements are liable to occur, there has been a consistent improvement for the past fifty years in both sexes. The results are due to the healthier conditions and to immense strides in medical and surgical science. Personally I think dental science has also contributed. In Suffolk sheep were labelled "F.M.," which meant "full-mouthed," when they came to market, and a horse's teeth were regarded as an indication of age as well as of usefulness. The human animal now enjoys a good mastication by means of well-fitting dentures and can defy the dangers of indigestion. Perhaps the best way of visualising the result is by means of a diagram, and the following one has been prepared to



compare the expectation of life by the Northampton and Carlisle Tables with the latest English Life Tables No. 10 for both sexes.

Even the English Life Tables do not represent the highest attainable or indeed attained. Sir Alfred Watson's report in addition to more detailed comparisons of the results of investigations contains interesting tables for various geographical areas. These prove, for example, that North 1 (Northumberland and Durham) Region, which exhibits the worst mortality, and East Region, which includes the Fens and eastern counties and exhibits the best, are very far apart. Moreover, the tables include all sorts and conditions of men, some in hospital and many whose occupations are by no means healthy.

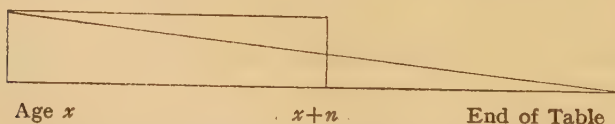
ANNUITY AND ASSURANCE EXPERIENCES.

Therefore it is by no means surprising that self-selection exercised by annuitants and medical selection on the part of life offices succeed in eliminating bad lives and producing an even better standard. The A1924-29 experience of assured lives relating to those five years recently published jointly by the Institute and Faculty of Actuaries shows at age 35 (which is about the average at which policies are effected) an expectation of life of 36.35 years, over two years higher than the English Life Tables, viz., 33.87 years for male lives, most of the policies being taken out on men. That is a table which it would not be right to use for valuing reversions, because at the higher ages where no new policies are effected the effects of selection have disappeared to a great extent, and at 75 the "ultimate" expectation of life for policies three or more years in force (7.01) is not much more than the 6.43 of the English Life Table No. 10 for males. Life tenants as a class closely resemble annuitants. They have the same regular income and live a sheltered existence. So that it is not surprising to find that the corresponding figure by the Government annuity experience is 7.07 and 7.94 by the corresponding British Offices annuity

experience (1900-20). Investigations made by Mr. E. H. Lever into the mortality experience of life tenants in the 15 years of the present century, 1905-1919, have the merit of relating to the right type, and the tables given in Vol. LIII., page 1, of the "Journal of the Institute of Actuaries" can be and are used for buying reversions. They give as a rule a slightly higher value than the annuity experience would produce, which is sometimes the means of giving the little more, and ah! how much it is! There the matter may be left with a cordial recommendation to get the volume containing his tables from Mr. S. H. Jarvis, the assistant secretary of the Institute of Actuaries at a price of 5s. to non-members. The "Government Life Annuitants" was published in 1924 at 2s. net, but is now out of print, so you must wait for the next experience almost due. Where reversions are concerned the female element predominates, and there is an old Scots proverb, "Ye canna kill an auld wife; ye canna even poison her."

REVERSIONS.

Important as the mortality element is the other factors, viz., the rate of interest to be employed in discounting the future payments, and, if possible, most important of all, the value placed upon the property or fund in reversion require careful consideration. In regard to interest it is not correct to treat the after-lifetime as if it were a term-certain equal to the number of years' expectation of life. The best demonstration I know was given by my late chief, Mr. W. J. H. Whittall, in a paper presented to the Birmingham Insurance Institute in 1889 and is as follows:—



"Here the rectangular figure represents the actual money which would pass under a number (sufficient to form an

average) of annuities-certain for n years. The extended triangle represents the actual money which would pass under a similar number of life annuities granted at the same time. The area covered by both figures is exactly the same. Hence, we see that if interest were disregarded the two benefits would be of equal value. But when interest is brought into account, then we see that the life annuity must necessarily be smaller in present value."

Inwood's Tables on page 38 of the introduction to the 33rd edition give figures for age 35 by the Carlisle Table, which show that the life annuity values are smaller to the extent of 10 per cent. nearly.

The little book* which contains the above gives in addition a simple explanation of the manner in which the single premium or present value of a unit payable on the death of a person aged x is obtained. In theory the single premium is the unit minus the capitalised value of the interest. This is obtained by multiplying the rate of interest by the annuity value which represents the present value of 1 per annum for the life in question by the mortality table adopted. In discussing the expectation of life I explained that there is a fractional period in the year of death and on the average half a year will be lived in the year current at death. It usually takes about another half-year before the proceeds are received during which little or no interest is earned, and the income has to be apportioned up to the date of death and paid to the executors of the life tenant. There are also legal costs so that the usual plan is to calculate the value as at the end of the year of death. There is a simple way of so doing by taking the interest in advance but allowing for the year's interest that it will earn. For example, if $\cdot0476$ be used instead of $\cdot05$ at 5 per cent. it will produce $\cdot05$ when $\cdot0024$ or 5 per cent. on $\cdot0476$ is added. Now the tabulated annuity value represents the present value of 1 payable on each successive anniversary which the annuitant attains. If, therefore, 1 be added to give

* *Theory of Life Assurance*, by W. J. H. Whittall. (C. & E. Layton, 56, Farringdon Street. Price 2s. net.)

what is termed the annuity-due, the appropriate factor is obtained for capitalising the $\cdot 0476$ for every year entered upon by the life in question. This sum deducted from the unit puts the purchaser in the same position as if he had an investment yielding a regular annual income of 5 per cent. In the old days the life offices used to set up an annuity of this kind in their books so that the whole of the mortality risk was thrown on the annuity fund. There is a survival of this method still extant at the Estate Duty Office where the tables in the Schedules to the Succession Duty Act, 1853, which are based on 4 per cent. interest, are used. But this table, which is the one already mentioned as having been prepared by Finlaison in 1829 from the Irish Tontines, overstates the mortality to such an extent that a few years ago the Law Society issued a warning to its members that the values of reversions so obtained were far too high and an actuarial valuation should be substituted. Unfortunately the system is so deep-rooted in solicitors' offices that it has not even now succumbed. There is a statutory obligation to employ the table for legacy and succession duty on annuities and life interests. The table is obsolete, and the method does not allow for the fact that it is not the fund now which has to be considered but the amount which is likely to be realised in perhaps twenty years' time when the reversion falls into possession when duty and costs will have to be met. Modern practice is to take the single premium and use the appropriate rates of mortality and interest at the same rate throughout. The rate which the fund is earning is not the appropriate rate, because from an investment standpoint reversions are open to the following serious objections, viz. :—

- (i.) They produce no income on which to live.
- (ii.) It is only by buying a number sufficient to yield an average that the transaction ceases to be a gamble.
- (iii.) The only protection of the purchaser is the notice to the trustees who are in legal possession of the

investments. New trustees may be appointed and fresh notices must be served every time a new one is in office.

- (iv.) It is necessary to impose distringages on the investments so that when a new trustee is appointed or any change is made in the investments 8 days' warning is given to make enquiries, and this costs money.
- (v.) There are cases in which the investments are not wisely chosen and more regard is paid to the income of the life tenant than is fair to the reversioners, *e.g.*, 4 per cent. Funding Loan at 115 is a full trustee security, but by the time the life tenant dies it may be redeemed at 100 and must tend towards that figure in 1960.
- (vi.) Legal costs are always incurred when there is a change in the trustees and may be incurred in connection with Court proceedings.
- (vii.) In such proceedings the purchasers of the interests of beneficiaries are always cited, and though their counsel's fees and other costs are usually borne by the fund, all beneficiaries or their assigns must bear their share.
- (viii.) There is danger of a defect in title or misinterpretation of the instrument creating the trust or misappropriation of the fund itself.
- (ix.) Aggregation with the free estate or other settled property of the life tenant may result in an increase in the rate of duty although purchasers are protected by clauses in all the Finance Acts against any new duties after the date of purchase.
- (x.) Future depreciation in the fund owing to an increase in the value of money, such as has occurred within the last few years and will occur again.

In my opinion the foregoing considerations justify a high rate of interest apart from the fact that in capitalising that interest at the same high rate by using the theoretical single premium the deduction from the foregoing unit is simultaneously reduced. Admittedly in these days of high taxation, sur-tax payers find reversions and policies afford a means of escaping tax at the highest rate on a portion of their income and force the price up, being content with a low net rate, but this does not affect the merits of the investment as such.

While the number of private investors, to whom an investment which produces no income appeals, is strictly limited, institutions such as life offices, which have to accumulate funds, welcome this type of investment. Not only does it reinvest the income automatically, but, in the case of contingent reversions, necessitates policies. Reversionary companies too specialise in this type of investment. In England the big ones now are nearly all owned or controlled by life offices for the following reasons. Prior to 1915, although income tax was less important than it is now, there was an additional advantage by reason of the fact that the profits from reversions were not taxed. When, in 1915, the basis of assessment became interest "minus expenses and commission," the Chancellor made it "plus profit on reversions," with the result that when reversions fall in tax has to be paid, in the case of life offices, on the difference between the purchase price and the amount eventually received. My object in stressing this point is to emphasise the important difference between the former tax-free investment still enjoyed by individuals and the present one where perhaps a quarter of the interest is paid away in tax. That is why in the following table, which I have taken the liberty of extracting from the booklet prepared by Mr. H. J. Tappenden, F.I.A., for the Institute of Actuaries Students' Society, you will see that the rates of interest are 6 per cent. and $5\frac{1}{2}$ per cent. respectively. For valuing reversions on the books 6 per cent. is adopted, and there is a considerable valuation strain to be met if reversions are

VALUES OF A_x *

Age x	MALES			Carlisle 6%	FEMALES		
	Lever 6%	$a(m)$ 6%	$a(m)$ 5½%		Lever 6%	$a(f)$ 6%	$a(f)$ 5½%
50	·371	·298	·324	·342	·272	·247	·272
51	·379	·309	·335	·353	·282	·256	·281
52	·388	·321	·347	·366	·293	·265	·290
53	·398	·333	·359	·378	·304	·274	·300
54	·407	·345	·371	·391	·315	·284	·310
55	·418	·357	·383	·404	·326	·294	·321
56	·428	·369	·396	·418	·338	·305	·331
57	·439	·382	·409	·432	·351	·316	·343
58	·450	·395	·422	·447	·363	·328	·355
59	·461	·408	·435	·461	·376	·340	·367
60	·473	·422	·448	·473	·390	·352	·379
61	·485	·435	·462	·484	·403	·365	·392
62	·498	·449	·475	·495	·417	·379	·406
63	·511	·463	·489	·507	·432	·393	·420
64	·524	·477	·503	·519	·446	·407	·434
65	·537	·491	·517	·531	·461	·422	·449
66	·550	·505	·531	·544	·476	·437	·464
67	·564	·520	·545	·558	·491	·452	·479
68	·578	·535	·560	·573	·507	·468	·494
69	·591	·549	·574	·588	·522	·484	·510
70	·605	·564	·588	·604	·538	·500	·526
71	·619	·580	·603	·621	·554	·517	·543
72	·633	·595	·618	·636	·570	·534	·559
73	·648	·610	·633	·651	·586	·551	·576
74	·662	·625	·647	·664	·602	·568	·592
75	·676	·641	·662	·674	·617	·585	·609
76	·689	·655	·676	·684	·633	·602	·625
77	·703	·670	·690	·694	·649	·619	·642
78	·716	·683	·703	·704	·664	·636	·658
79	·730	·696	·715	·715	·679	·653	·674
80	·743	·709	·727	·725	·694	·670	·690

Lever 6%: Full aggregate table. $a(f)$ and $a(m)$: Ultimate values.

* Extracted from Institute of Actuaries Students' Society's Consolidation of Reading Series by H. J. Tappenden, F.I.A. (Cambridge: At the University Press, 1934. Net 7s. 6d.)

bought at a lower rate, especially if a percentage is thrown off the fund as usual to provide against future depreciation.

In this table you will see side by side with the Carlisle 6 per cent. values, which are also given on p. 281 of Inwood (thirty-third edition), the corresponding single premium by the Annuitants' Experience (1900-20) designated *a* (*m*) and *a* (*f*) by sex. It shows how unsafe it is to use the Carlisle Table for females even at an age three years less (roughly the same as Government 1883), *e.g.*, at age 70 the Carlisle value .604 is 20 per cent. above the annuitant female (.5) which corresponds to age 62 by the Carlisle. Inwood makes a point that it is kept up to date and published in fresh editions. It ought to have been possible, without infringing copyrights, to get something better than the Government Annuity Experience 1883—two similar ones having been published since. These are presumably public property and H.M. Stationery Office is always most obliging. The Institute and Faculty of Actuaries granted permission for their joint experience known as the British Offices Tables covering 1863-93 to be used in the 32nd edition, but even that relates to male assured lives under whole-life policies on the average 50 or 60 years ago. To use the single premiums by this O^x Table (which are given on p. 285) to value a reversion even on a male life would take no account of the enormous improvement in vitality disclosed by the A 1924-29 Tables and for female life tenants the table could never have been suitable. No doubt, if asked, similar permission would be given by the joint bodies to use the modern tables. Meantime Mr. Tappenden's book (published by Cambridge University Press at 7s. 6d.) would be worth buying. In cases of more than one life it is a simple matter to substitute a Carlisle or other life at the equivalent age and use the tables for two or three lives at a suitable rate of interest if available.

CONTINGENT REVERSIONS.

The only risk that ought to be run in buying reversions is in regard to the rate of interest which in any given case

may be extremely high if the life tenant dies immediately, or extremely low if life be unduly prolonged. All other risks must be covered by the appropriate policy. Thereby the reversion (*cum* policy) is made absolute and becomes expectant on the reversion falling into possession or on a claim arising whichever first happen. In many cases the contingencies are nominal and can be covered at a moderate single premium, *e.g.*, issue risks, name and arms risks and re-marriage risks (which may be left uncovered if preferred as involving merely prolongation). In the case of reversions which depend upon the existence of the reversioner, quotations for single premiums for survivorship assurances can be obtained. Individual cases naturally depend on the rate of single premium at which the risk is accepted after medical examination. Only a provisional value should be fixed until the life is definitely accepted. Proof of existence must also be ensured for the future, as it is necessary to prove that the reversioner is alive when the reversion falls in to get the money, or the claim if he dies before the life tenant. To allow for the extra trouble and expense a full 6 per cent. rate of interest is justifiable.

In valuing the reversion covered by the policy the joint life single premium at that rate by a modern table should be used. Taking the reversioner as a male aged 40 (41 next birthday for the policy) and the life tenant as a male aged 75 for example, the 6 per cent. $a(m)$ Annuity value is readily ascertainable on p. 167 of "The Mortality of Annuitants, 1900-20" by interpolating between the adjacent values on the right-hand page which contains the "ultimate" table. The "select" table on the opposite page of the opening applies to lives purchasing annuities who exercise self-selection against the office. There is no self-selection in the case of reversions, but a sale is usually avoided if the life tenant is known to be in bad health. Entering the conversion table at 6 per cent. (the table on p. 323 of Inwood only goes up to 5 per cent. but another column can be added thus):—

SINGLE PREMIUM CONVERSION TABLE FOR FINDING BY INSPECTION
THE PRESENT VALUE OF £1 DUE AT DEATH FROM THE VALUE OF AN
ANNUITY FOR LIFE.

Value of Annuity.	Value of £1 at Death. 6 per cent.	Value of Annuity.	Value of £1 at Death. 6 per cent.
0	·94340	9	·43396
1	·88679	10	·37736
2	·83019	11	·32075
3	·77358	12	·26415
4	·71698	13	·20755
5	·66038	14	·15094
6	·60377	15	·09434
7	·54717	16	·00000
8	·49057		

Difference of Annuity.	Difference (subtractive) of Value of £1 at Death. 6 per cent.	Difference of Annuity.	Difference (subtractive) of Value of £1 at Death. 6 per cent.
·1	·00566	·6	·03396
·2	·01132	·7	·03962
·3	·01698	·8	·04528
·4	·02264	·9	·05094
·5	·02830		

The single premium is seen to be (by using the table of differences):—

Value of £1 at death.

Value of Annuity (5) 66038

Difference for ·125 deductive ($\frac{1}{8}$ of
·0566) 00707

Value of Annuity (5·125) 65331

Deduct—

Office Single Premium for Survivor-

ship Assurance on 41 n.b.d.,

v. 75 l.b.d. 09450 (9 guineas per
cent., say).

Multiply sum assured by 55881 for value of

Contingent Reversion (subject to costs of purchase).

LIFE INTERESTS.

The same problem as to proof of existence has to be solved in respect of the life upon which the income depends before the Trustees will pay the purchaser. A book was published recently by the *Estates Gazette, Ltd.*, containing diagrams of the years' purchase of life interests on the single and dual rate principles by W. R. Jenkins in which the author states:—

“Probably a large proportion of those who receive incomes from leasehold property do not as a fact invest a sinking fund to redeem the purchase price, but it is likely that almost anyone who receives an income terminable on the death of another person would wish to insure the life of that person.”

The only practical method of arriving at the value of a life interest, therefore, is to find the premium for insuring a life of that kind. If only acceptable on special terms the value is duly adjusted. The author, however, goes too far when he calculates the net premiums by the English Life Table No. 9 at 3 per cent., combining the sexes, and submits diagrams based on the assumption that a policy could be effected at those rates. Offices are capable of fixing their premiums for themselves and use a rather higher rate than 3 per cent., but load the premiums for expenses and commission. There are only two rates involved, the rate of premium and the rate of interest. Inwood gives a neat table at 3 per cent. on page 324 from which the annual premium corresponding to any annuity value can be obtained at various other rates of interest as well. All that is necessary, having got the rate of premium for the covering policy after acceptance for a whole world and unconditional assurance in a first-class office, is to enter the table backwards. Suppose that a life has been accepted at an annual premium of £2 10s. per cent. The tax is deducted from the income so that a net rate of about 4 per cent. would be appropriate. From the foot-notes on page 324, .0093 must be added to change from 4 per cent. to 3 per cent. Entering

the table inversely with $\cdot 0343$ as the rate of premium, the value of the annuity is over 14.7 and under 14.8, say, 14.75 y.p. The sum assured being 15.75, the premium at $2\frac{1}{2}$ per cent. is $\cdot 394$ approximately. The initial outlay of 15.144 at 4 per cent. requires about $\cdot 606$ for interest. Together they absorb the unit. Costs must be deducted of course from the 14.75, but not the first premium which is treated as invested. The premium and interest must be met out of the net income. For that reason alone it is wrong to value a life interest without allowing for a premium. Deduction for repairs (if any) insurance and management expenses as well as Schedule A tax should be taken off, and allowance be made for unlets. There is no need really to use a conversion table at all to fix the sum assured, and thence the value of a life interest of 1 per annum. Together, as already explained, the premium and interest equal 1. As interest is to be earned for the whole of the year in which the life drops, the best way is to charge it in advance, when it will also synchronise with the premium. For example, for 4 per cent. or $\cdot 04$ substitute $\cdot 04$ divided by 1.04 equals $\cdot 0385$ nearly. Add $\cdot 025$ for the premium and divide the unit of income by $\cdot 0635$ to get the sum assured, which is 15.75 as before. The same sum assured is needed for a

Reversionary Life Interest,

because when the life interest falls into possession on the death of the life aged 75 (say) who now enjoys the income, the purchaser needs a covering policy in existence. By that time the reversioner may be uninsurable. The purchaser will thus be possessed of a contingent reversion to the sum assured covered by a whole-life policy instead of a survivorship assurance. For example, in this case the sum in reversion is 15.75. The premium ($\cdot 394$) with the interest, which ought to be at 6 per cent. (not 4 per cent.), must be commuted by the appropriate annuity values during the joint lives of the reversioner aged 40 (say) and the life

tenant (75), a male as a rule. Only an institution ought to run the risk of letting the policy lapse. To meet this the office can be asked to commute the premium during the joint lives. The value of a reversionary life interest of £1,000 p.a. (net in every sense of the word) is readily seen to be:—

	£
Sum Assured ... £15,750 on life of reversioner.	
Value on death of first to die of reversioner and life tenant ... $£15,750 \times .65331$ (as before)=	10,290
Annual Premium £394, commuted during joint lives of reversioner and life tenant @ 7 y.p. ...	2,758
Value allowing 6 per cent. in reversion and 4 per cent. (net) in possession	<u>7,532</u>

While the life tenant is alive the sum assured is treated in the books as an ordinary absolute reversion. Offices usually pay the annual premium, but it is not wise for an individual to do so, even if by commuting the premium during the joint lives he may make less profit by the premature death of either.

DEATH DUTIES.

Emphatically *net* income should be adopted in the case of a reversionary life interest because death duties as well as income tax must be deducted. Every successive Finance Act contains a clause whereby the purchaser of a reversion is protected against increases in duty subsequent to date of purchase. Indeed, if it were not so, and it is not likely to be in countries other than this, purchases would be almost impossible. From past experience it would be difficult to estimate the liability especially with a big estate. Taxing statutes are interpreted strictly on their *ipsissima verba*, and it is doubtful if a purchaser of a reversionary life interest, which is "income" and not "capital," could

claim the benefit of a such a provision, and thus obtain exemption from an increase in the rate of estate duty. There is the further liability for succession duty which, though the rate is much lower, is payable by instalments spread over the five years following death out of the actual income which is needed for premiums and interest. In practice, therefore, the usual plan is to grant an advance in consideration of a fixed reversionary annuity to commence from the death of the life tenant and to continue during the period of survival. The borrower can, as a rule, redeem for the sum assured at any time, which means that it may pay him to do so when in possession if the rate of interest is high, for he can use the policy to cover a loan on his life interest and get his life assurance allowance on the premium. Make the rate 1 per cent. higher in reversion than in possession to counteract this tendency. Enough margin ought also to be kept to maintain the borrower in existence especially if the lender takes the lion's share of the big policy, which is about the only attraction in a transaction of this kind. Estate duty is a certainty, since by Section 14 of the Finance Act of 1914 the only exception is that of the surviving spouse, and such is seldom the tenant for life of a settled property.

CONCLUSION.

Many further points might be mentioned, but the limit fixed by your Secretary has already been exceeded, for which I crave your indulgence. I bid you farewell with a cordial hope that you will never use the Northampton Table again, and look askance at all others unless and until you are sure that they represent modern mortality. Above all, do not treat the expectation of life as if it were a term of years certain, but regard it as a sort of batting average.